Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1. (Currently Amended) An actuator comprising:

a ~~an~~ rotating electric motor having a rotating armature, two or more magnets, and one or more coils, wherein ~~that generates~~ a back emf is generated when the one or more coils pass through the lines of flux of the two or more magnets, the back emf varying during each commutation period of the motor;

a control system for controlling the speed of the ~~electric~~ motor, the control system including:

a controller;

circuitry for allowing the controller to obtain a measure that is related to an average ~~sample the~~ back emf ~~of the motor~~ over at least one commutation period of the motor, wherein the controller uses the ~~sampled~~ measure that is related to the average back emf as feedback representative of motor speed for use in controlling the speed of the motor.

2. (Currently Amended) The actuator of claim 1, further comprising a motor drive circuit for driving the motor, wherein the controller turns off the motor drive circuit and allows current at the motor to decay to zero before obtaining the measure that is related to the average ~~sampling the~~ back emf.

3. (Original) The actuator of claim 2, wherein the controller includes a pulse width modulator for controlling the motor drive circuit, the pulse width modulator providing a duty cycle having an on-time and an off-time.

4. (Original) The actuator of claim 3, wherein the motor drive circuit is turned off for a period of time greater than the off-time of the duty cycle.

5. (Original) The actuator of claim 2, wherein the motor drive circuit is turned off for at least 2 ms to allow for current decay and for sampling.

6. (Original) The actuator of claim 5, wherein the motor drive circuit is turned off for at least 3 ms to allow for current decay and for sampling.

7. (Currently Amended) The actuator of claim 1, wherein the controller uses the circuitry to sample[[s]] multiple back emf values during at least one commutation period of the motor, and uses an average of the multiple back emf values as feedback representative of motor speed.

8. (Original) The actuator of claim 1, wherein the electric motor includes a permanent magnet DC brush motor.

9. (Currently Amended) The actuator of claim [[1]] 8, wherein the permanent magnet brush motor generates a back emf having a waveform, and wherein the controller uses

the circuitry to sample[[s]] multiple back emf values over a time period corresponding generally to one wavelength of the waveform.

10. (Original) The actuator of claim 9, wherein the controller uses an average of the sampled back emf values as feedback representative of motor speed.

11. (Currently Amended) The actuator of claim 9, wherein the controller uses the circuitry to sample[[s]] at least 4 back emf values over a time period corresponding to one wavelength of the waveform.

12. (Currently Amended) The actuator of claim 9, wherein the controller uses the circuitry to sample[[s]] at least 8 back emf values over a time period corresponding to one wavelength of the waveform.

13. (Currently Amended) The actuator of claim 9, wherein the controller uses the circuitry to sample[[s]] at least 16 back emf values over a time period corresponding to one wavelength of the waveform.

14. (Original) The actuator of claim 1, wherein the motor is coupled to a damper vane.

15. (Original) The actuator of claim 1, wherein the motor is coupled to a valve.

16. (Currently Amended) The actuator of claim 1, wherein the motor includes first and second terminals, and wherein the circuitry for allowing the controller to obtain the measure that is related to the average ~~sample the~~ back emf of the motor includes a first conductive line that electrically connects the first terminal to the controller and a second conductive line that electrically connects the second terminal to the controller.

17. (Currently Amended) The actuator of claim 16, wherein the first and second conductive lines each include at least one resistor.

18. (Currently Amended) The actuator of claim 17, wherein the first and second conductive lines each include at least one capacitor.

19. (Currently Amended) A fluid flow control assembly comprising:

a permanent magnet DC brush motor that generates a back emf, wherein the back emf varies during each commutation period of the motor;

~~a control system for controlling the speed of the motor, the control system including:~~

a controller, the controller adapted to obtain a measure that is related to an average of the back emf over at least one commutation period of the motor, the controller further adapted to use the measure that is related to the average of the back emf;

~~circuitry for allowing the controller to sample the back emf of the motor, wherein the controller uses the sampled back emf~~ as feedback representative of motor speed for use in controlling the speed of the motor; and

a fluid flow control structure coupled to the motor.

20. (Original) The assembly of claim 19, wherein the fluid flow control structure includes a damper vane.

21. (Original) The assembly of claim 19, wherein the fluid flow control structure includes a valve.

22. (Currently Amended) The assembly of claim 19, further comprising a motor drive circuit for driving the motor, wherein the controller turns off the motor drive circuit and allows current at the motor to decay to zero before obtaining the measure that is related to the average of the back emf of the motor ~~sampling the back emf~~.

23. (Currently Amended) The assembly of claim 22, wherein the motor drive circuit is turned off for at least 2 ms to allow for current decay and for obtaining the measure that is related to the average of the back emf of the motor ~~sampling~~.

24. (Currently Amended) The assembly of claim 23, wherein the motor drive circuit is turned off for at least 3 ms to allow for current decay and for obtaining the measure that is related to the average of the back emf of the motor ~~sampling~~.

25. (Original) The assembly of claim 19, wherein the controller samples multiple back emf values and uses an average of the back emf values as feedback representative of motor speed.

26. (Currently Amended) A method for controlling the speed of a permanent magnet DC brush motor, the method comprising:

supplying current to the motor to drive the motor at a first speed;

terminating the supply of current to the motor such that the current decays to zero;

after the current decays to zero, obtaining a measure that is related to an average of ~~measuring~~ the back emf generated by the motor over at least one commutation period of the motor; and

inputting the ~~measured~~ measure that is related to an average of back emf into a speed control algorithm for controlling the speed of the motor, the measured back emf being representative of the first speed.

27. (Original) The method of claim 26, further comprising re-supplying current to the motor after the back emf has been measured.

28. (Currently Amended) The method of claim 26, further comprising measuring the back emf by taking multiple discrete back emf measurements while the supply of current is terminated, and inputting an average of the back emf measurements into the speed control algorithm.

29. (Original) The method of claim 28, wherein the back emf measurements are taken over a time period greater than 2 milliseconds.

30. (Original) The method of claim 28, wherein the back emf generates a waveform, and wherein the multiple back emf measurements are taken within a time period corresponding generally to one wavelength of the waveform.

31. (Original) A method for calibrating a speed control system for an electric motor, the method comprising:

running the motor using a nominal value as a speed command;

measuring the motor speed generated by the nominal value; and

using the ratio of the nominal value and the measured speed to calibrate the speed control system with respect to the motor.

32. (New) An actuator comprising:

an electric motor that generates a back emf with a generally repeating waveform; and

a controller, the controller adapted to obtain a measure that is related to an average back emf of the motor over a time period corresponding generally to at least one wavelength of the waveform, the controller further adapted to use the measure that is related to the average back emf to control the speed of the motor.

33. (New) A method for controlling the speed of an electric motor, the method comprising:

supplying current to the motor to drive the motor at a first speed, the supply current being driven at a frequency that corresponds to the first speed with current peaks and current valleys;

suspending the supply of current such that at least one current peak and/or current valley is skipped;

while the supply of current is suspended, allowing the current to decay to zero or substantially zero and then obtaining a measure of the back emf generated by the motor; and

using the measure of the back emf as feedback to control the speed of the motor.